# Checkout and Launch Control System (CLCS)

# Thor Integration Plan

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Prepared By:

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# 1.0  Scope

This document defines the integration plan for development and delivery of the Checkout and Launch Control System (CLCS), Thor release.

# 2.0  Description

This document will outline the process of collecting and placing under configuration management the released software developed at Johnson Space Center (JSC) and Kennedy Space Center (KSC), installing the software on multiple platforms, and performing system level integration in preparation for system testing of the Thor  delivery.

# 3.0  Applicable Documents

| Document Number | Description |
| --- | --- |
| 84K00150-002 | Thor Delivery Document |
| 84K00200-000 | CLCS System Level Specification (SLS) |
| 84K00052 | CLCS Configuration Management Plan |
| 84K00070 | Software Development Plan |
| 84K00055 | Safety and Mission Assurance Plan |
| 84K00210 | System Design Document |
| 84K00056 | CLCS System Test Plan |

# 4.0  Thor Integration Description

## 4.1  Documentation

Integration will be involved in the development of the Thor Integration Plan, System Test Procedures, System Integration Report, System Test Report, and the Delivery Acceptance Review. These documents contain development and operations related information which are delivery related.  These documents are delivered to Configuration Management and recorded in the Razor database for future reference.

## 4.2  Computer Software Configuration Item (CSCI) Support

Integration will plan to attend Computer Software Configuration Item *(*CSCI) Thor Design Panels and will review and redline subsystem level requirements, Interface Agreements (IA), Application Program Interfaces (API's), and Data Flow Diagrams.  In addition, dependencies between CSCI's will be tracked, CIT procedure assistance will be provided, and CSCI Integration

Testing (CIT) will be coordinated by Integration.   The Thor CSCI/ Integration contact matrix is shown in Figure 1.

| CSCI | Dave H. | Jeff H. | Paul K. | Robert S. |
|---|---|---|---|---|
| Application Services | | | | ✳ |
| Near Real-Time Advisory | | | ✳ | |
| Data Support tools | | ✳ | | |
| Data Dist. & Processing | | | | ✳ |
| Data Recording & Archival | ✳ | | | |
| System Control | | ✳ | | |
| System Viewers | ✳ | | | |
| System Services | | | | ✳ |
| Test Build & Control | | | ✳ | |
| System Build | | ✳ | | |
| DBSAFE | | ✳ | | |
| Cons. SDS G/W Certification | ✳ | | | |
| Cons. System G/W Services | | ✳ | | |
| Command Support | ✳ | | | |
| Comon Gateway Services | | | ✳ | |
| LDB Gateway Services | ✳ | | | |
| PCM D/L Gateway Services | | ✳ | | |
| Simulation Gateway Services | | | | ✳ |
| GSE Gateway Services | | | ✳ | |
| User Application Processing | | | | ✳ |
| **IPT** | | | | |
| Orbiter Power Up/Down | | | ✳ | |
| HMF | | | | ✳ |
| **PathFinders** | | | | |
| Test Application Script | ✳ | | | |
| Regression Testing | | | | ✳ |
| Performance Modeling | | | ✳ | |
| BASIS | | ✳ | | |
| HCI Open Systems | ✳ | | | |
| Gateway Open Systems | | | ✳ | |

Figure 1.  Thor Contact matrix

## 4.3  Facilities

Facility locations included in the Thor delivery are at Kennedy Space Center (KSC) Florida, and at Johnson Space Center (JSC) Houston Texas.  Included facilities at KSC are the Satellite Development Environment (SDE-1, SDE-2) located in the Process Control Center (PCC), Integrated Development Environment (IDE-1) located in the Launch Control Center 2R24,  Hypergolic Maintenance Facility (HMF) located in the Hypergol/Payload Test Area (M7-1061), and the LCC-X located in the Launch Control Center Firing Room 2 bubble.  The Satellite Development Environment-JSC is located at JSC (Houston) and will be supported by KSC Integration on a "as applicable" basis. The locations at KSC will contain hardware and software which will require Integration configuration and support for the Thor delivery.

## 4.4 Integration Activities

### 4.4.1  Dependencies

In order for integration activities to proceed in an efficient manner, certain items need to come from the development team.  User's guides and operating procedures assist in developing test cases and integration flow, draft copies are acceptable.  In addition, test tool training is an effective troubleshooting aid to the integration team during formal integration.

### 4.4.2  Delivery

Integration responsibilities include supporting the Delivery Manager.   To accomplish this task, an integrated schedule from individual CSCI schedules will be created and maintained. Furthermore,  Delivery Manager's meetings are coordinated following Design Panels which allow CSCI leads and support personnel to communicate dependencies,  schedule conflicts, issues, and recovery plans for the upcoming delivery.
Finally, a Delivery Acceptance Review will be conducted with the user community to summarize the development, integration and testing activities, document system configuration and identify issues and their status.

### 4.4.3  Informal

Informal Integration activities are tasks performed prior to completion of the last CIT.   This activity involves integration of Computer Software Components (CSC) and CSCI's as they become available. Whereas CIT's usually test CSCI's against their functional requirements using test tools, informal integration checks out various CSCI's against other delivered CSCI's for overall functionality.

### 4.4.4  Formal

Formal system integration activities begin with the completion of the last CIT. After completion of all development testing, the CM/Build group will perform a system level build. This baseline will be used for formal system integration and system test dry run activities.  Formal integration is generally accomplished in the IDE-1 (Appendix B); however, since the Thor baseline is primarily targeted for the HMF, integration will perform some formal activities in the HMF.

The system integration activity will be performed to verify system level capabilities. These capabilities include:  configuration management and build (SCID & TCID),  software promotion, configuration of hardware platforms, data distribution (gateway to DDP to CCWS), and data archival. CSCI test procedures will be utilized to assist in verification of these capabilities. Development personnel will be available to support System Integration and System Test personnel in identifying and resolving issues. High priority will be placed on resolving these issues to support a final system build in preparation for System Test.

Following formal system integration activities, System Integration personnel will prepare a System Integration Report to document integration results for each environment. The report will also document issues opened during integration, and address items encountered during the integration effort which identify opportunities for improvement in the CLCS development, integration and delivery process.
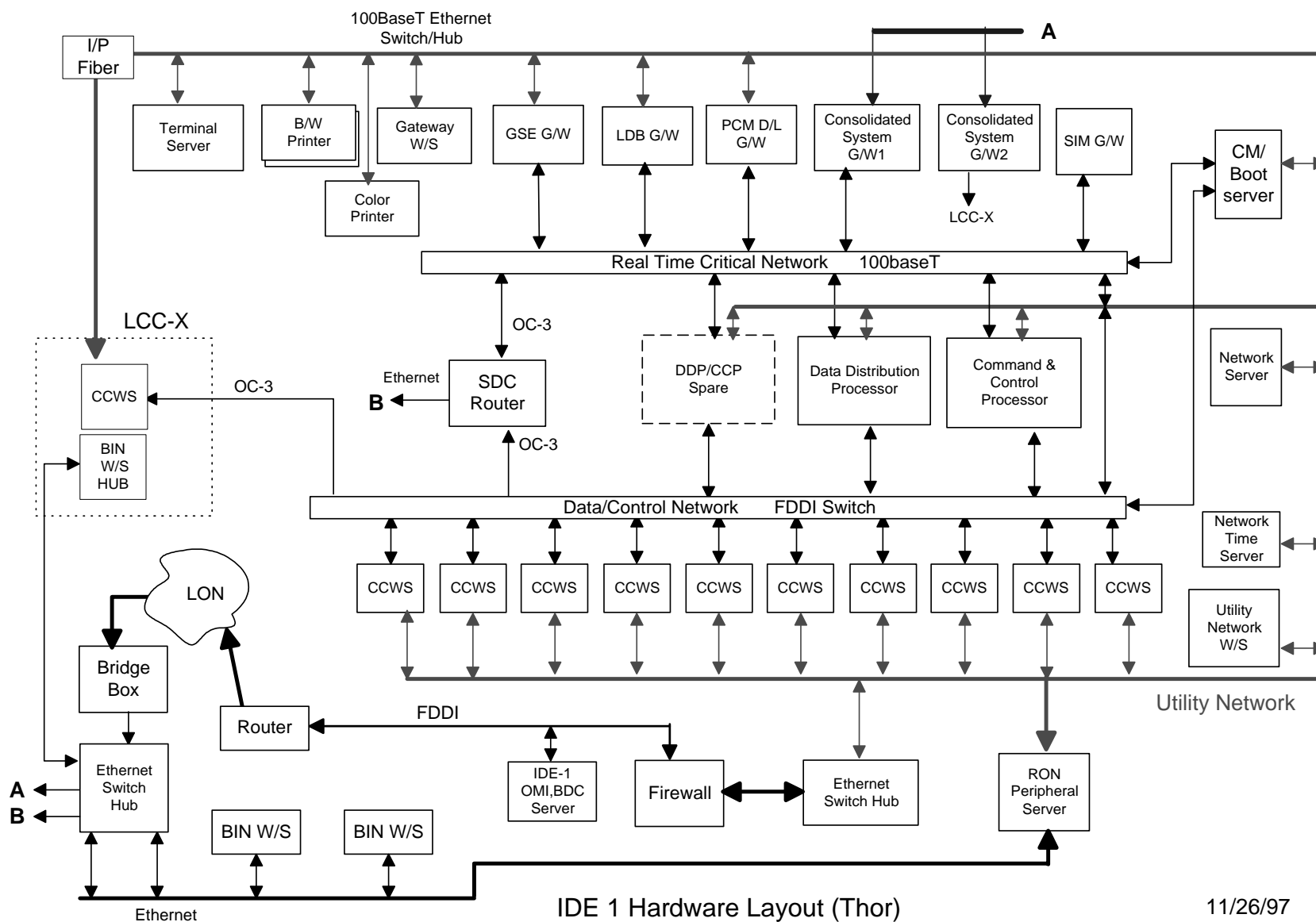
### 4.5  Demonstration Support

Demonstrations are held in the LCC-X and are coordinated according to CLCS program needs and KSC launch schedule.   Integration has the responsibility to verify the LCC-X has the correct software loaded and configured to support each demonstration.  For the Thor delivery, the LCC-X will be converted to a standalone environment containing its own Data Distribution Processor (DDP), Command and Control Processor (CCP), and Consolidated System Gateway (CS GW).  Efforts will be required by the Integration group to verify proper operation of the LCC-X and the use of System Control to load and configure the system.

# Appendix A - Acronym List

| | |
|---|---|
| API | Application Program Interface |
| CCP | Command and Control Processor |
| CCWS | Command & Control Work Station |
| CIT | CSCI Integration Test |
| CLCS | Checkout and Launch Control System |
| CM | Configuration Management |
| CS | Consolidated Systems |
| CSC | Computer Software Component |
| CSCI | Computer Software Configuration Item |
| DDP | Data Distribution Processor |
| GW | Gateway |
| HCI | Human Computer Interface |
| HMF | Hypergolic Maintenance Facility |
| IA | Interface Agreement |
| IDE | Integrated Development Environment |
| JSC | Johnson Space Center |
| KSC | Kennedy Space Center |
| LCC | Launch Control Center |
| PCC | Process Control Center |
| SCID | System Configuration Identifier |
| SDE | Satellite Development Environment |
| SLS | System Level Specification |
| TCID | Test Configuration Identifier |

# Appendix B - IDE1 Hardware Layout (DRAFT)



**100BaseT Ethernet Switch/Hub**

**A**

I/P Fiber

Terminal Server

B/W Printer

Gateway W/S

GSE G/W

LDB G/W

PCM D/L G/W

Consolidated System G/W1

Consolidated System G/W2

SIM G/W

CM/ Boot server

Color Printer

LCC-X

CCWS

BIN W/S HUB

LCC-X

Real Time Critical Network    100baseT

OC-3

OC-3

Ethernet

SDC Router

B

OC-3

DDP/CCP Spare

Data Distribution Processor

Command & Control Processor

Network Server

Data/Control Network    FDDI Switch

LON

Bridge Box

Router

FDDI

CCWS CCWS CCWS CCWS CCWS CCWS CCWS CCWS CCWS CCWS

Network Time Server

Utility Network W/S

Utility Network

Ethernet Switch Hub

A
B

BIN W/S

BIN W/S

IDE-1 OMI,BDC Server

Firewall

Ethernet Switch Hub

RON Peripheral Server

Ethernet

IDE 1 Hardware Layout (Thor)

11/26/97

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